THE ETHIOPIAN SPECIES OF THE GENUS *METANIA* (PORIFERA, METANIIDAE): I. REDESCRIPTION OF *M. POTTSI*, COMB. N.

Carla Maria M. da Silva [1]
Cecília Volkmer-Ribeiro [1]

ABSTRACT

Tubella pottsi Weltner, 1895, from the Ethiopian Region, is redescribed and transferred to genus *Metania* Gray, 1867. New features of spicules, gemmules and skeleton structure are described and SEM illustrated. The following new synonymies are established with *Metania pottsi*: *Potamolepis schoutedeni* Burton, 1938, *M. lissostrongyla* Burton, 1938 and *M. vanryni* Brien, 1968.

KEYWORDS. Metaniidae, *Metania*, Ethiopian Region, Freshwater sponges, Taxonomy.

INTRODUCTION

The revision of the genus *Metania* Gray, 1867 started with the study of the Neotropical species: description of *Metania fittkaui* Volkmer-Ribeiro, 1979 and *M. subtilis* Volkmer-Ribeiro, 1979 from Amazonian waters (Volkmer-Ribeiro, 1979) and redescription of *M. reticulata* (Bowerbank, 1863), type species of *Metania*, recorded for the Brazilian and Venezuelan Amazonia, and of *M. spinata* (Carter, 1881), ranging from the Amazon basin to the northwest of São Paulo State (Volkmer-Ribeiro, 1984).

Volkmer-Ribeiro (1986) erected the family Metaniidae for the genera *Metania*, *Acalle* Gray, 1867, *Drulia* Gray, 1867 and *Corvomeyenia* Weltner, 1913. *Acalle* and *Drulia* are exclusively Neotropical and *Metania* is the only in the family to present a Gondwanic distribution. Volkmer-Ribeiro (1992) revised the genus *Corvomeyenia* with Neartic and Neotropical distribution.

Volkmer-Ribeiro & Costa (1992) described a Neotropical species, *Metania kiliani*, redescribed *M. spinata* (Carter, 1881) and proposed a key for all the five species from this region. Volkmer-Ribeiro & Costa (1993) redescribed the species of *Metania* from the Oriental and Australian regions upon SEM studies of the spicules and skeletal and gemmular structures.

Only four of the eight species of *Metania* recorded from the Ethiopian Region were originally described in this genus: *Metania lissostrongyla* Burton, 1938, *M. innominata*

1. Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Caixa Postal 1188, CEP 90001-970, Porto Alegre, RS, Brasil.

Burton, 1938, *M. vanryni* Brien, 1968 and *M. rhodesiana* Burton, 1938. The last one considered by PENNEY & RACEK (1968) as not generically determinable because neither gemmulae nor gemmoscleres were present. The other four species were referred to the genus *Metania* by the following authors: BURTON (1938) described *Spongilla brieni*, which had only immature gemmules, and considered its microscleres as identical to those of *Metania innominata* and *M. rhodesiana;* VOLKMER-RIBEIRO (1986) synonymized *Parametania* Brien, 1968 with *Metania* Gray, 1867, with the transfers of *P. schoutedeni* (Burton 1938) and *P. godeauxi* Brien, 1968 to this genus; PENNEY & RACEK (1968) synonymized *Tubella pottsi* Weltner, 1895 and *Metania lissostrongyla* with *M. vesparia* (von Martens, 1868). VOLKMER-RIBEIRO & COSTA (1993) removed *Tubella pottsi* and *M. lissotrongyla* from the synonymy of *Metania vesparium* (von Martens, 1868), maintaining both in their original genera.

MATERIAL AND METHODS

Fifty measures of length and widht as well as camera lucida drawings were made for each spicule category out of every specimen. To perform SEM analysis the spicules were boiled in nitric acid in a test tube until complete dissolution of the organic material. The cleaned spicules held in suspension in distilled water were next dropped on the stubbs and allowed to dry up. The gemmules were hand cut and glued on the stubs. Gold coating was performed in a BALTEC Sputter Coater and the materials were studied and photographed in a Jeol JSM / 5200. Abbreviations used in the text: BMNH, The Natural History Museum, London, England; INEAC, Institut National pour L'études Agronomiques du Congo Belge, Zaire; MCN, Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil; MRAC, Musée Royal de L'Áfrique Centrale, Tervüren, Belgium; ZMB, Zoologisches Museum der Humboldt Universität, Berlin, Germany.

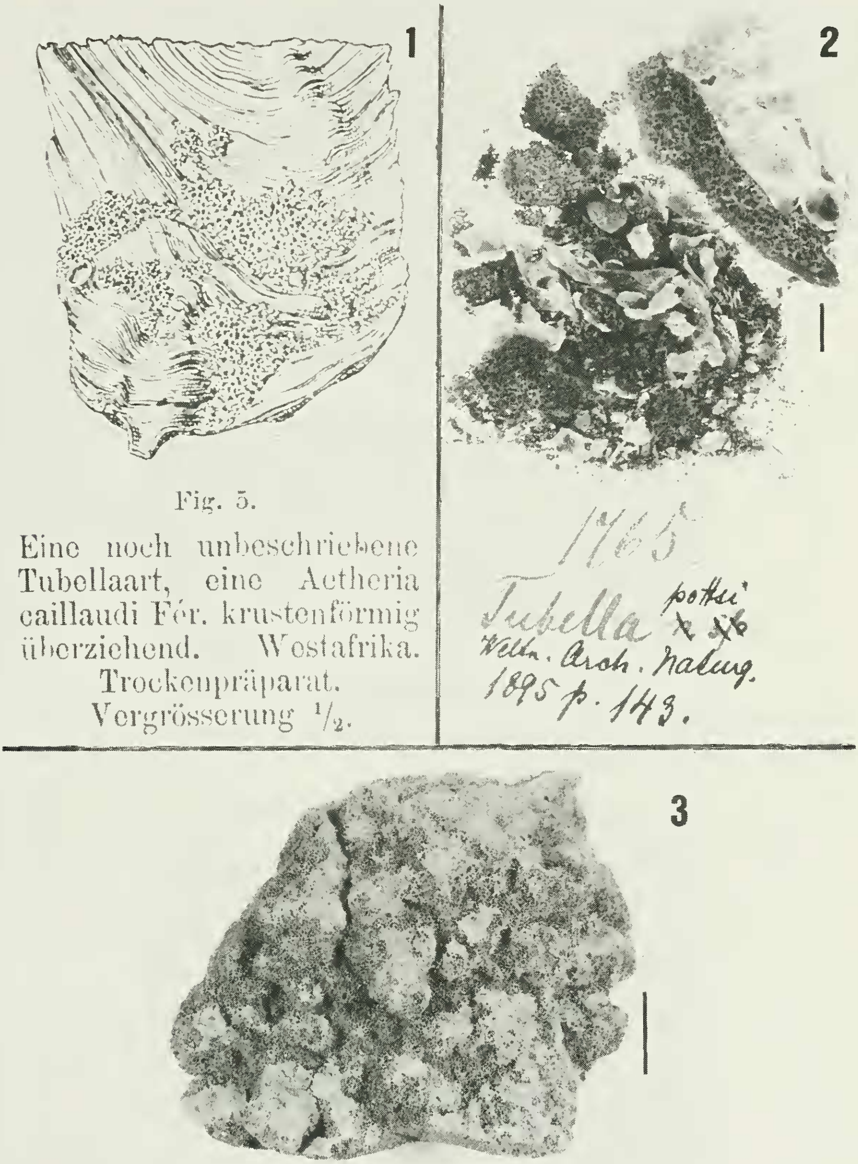
Metania pottsi (Weltner, 1895), comb. n.

(Figs. 1-12)

Tubella pottsi WELTNER, 1895: 143 (illustrated in WELTNER, 1894: fig. 5); ANNANDALE, 1914: 245; GEE, 1931: 46; 1933: 240; LAUBENFELS, 1936: 37; PENNEY, 1960: 59; PENNEY & RACEK, 1968: 149-151.
Acalle pottsi; BURTON, 1934: 412; ARNDT, 1936: 17.
Potamolepis schoutedeni BURTON, 1938: 461, fig. 3, pl. I, fig. 7. **N. Syn.**
Metania lissostrongyla BURTON, 1938: 463, fig. 6, pl. II, figs. 1-4; PENNEY, 1960: 45; BRIEN, 1968: 400, figs. 6,7, pl. III, figs. 25-31; PENNEY & RACEK, 1968: 149-151. **N. Syn.**
Metania vesparia PENNEY & RACEK, 1968: 149 (**partim** in syn.), pl. XIV, figs. 8-12 (**non** *Metania vesparium* von Martens, 1868: 61).
Parametania schoutedeni; BRIEN, 1968: 384, figs. 1,2, pl. 1, figs. 1-10.
Metania vanryni BRIEN, 1968: 406, figs. 8,9, pl. III, figs. 32-38. **N. Syn.**

Holotype and type locality. ZMB 1765, Zaire [ex Belgian Congo], Chiloango River, 1875, von Mechow leg. (figs. 1, 2).

Comments on the holotype. Weltner's brief original description of *Tubella pottsi* clearly refers to the examination of a single specimen, which he listed and illustrated as an unknown species in WELTNER (1894, fig. 1). The specimen is deposited in the ZMB, and is thus the holotype of *Metania pottsi*. The shell of the freshwater mussel *Aetheria caillaudi* upon which the sponge formed a thin and descontinuous crust (fig. 1) is presently, as well as the sponge, broken into fragments due to dryness (fig. 2). Quite probably the shell was already devoid of the mussel at the time of the sponge collection. The holotype presents all the features originally described besides the ones presently reported.



Figs. 1-3. *Metania pottsi* (Weltner, 1895): 1, original illustration of the sponge in WELTNER (1894); 2, same specimen, holotype (ZMB 1765) (Photograph by V. Heinrich, ZMB); 3, specimen from Chiloango River (MRAC, 1697) (Photograph by José Schuster, PUCRS). Bar = 2cm.

Diagnosis. Sponges forming from shallow crusts to bulbous growths with a conspicuously reticulated skeleton of main and secondary fibers, hispid surface usually sculptured into crests, bumps and furrows. Megascleres composing two categories of strongyles, the alpha megascleres smooth and the beta megascleres shorter, rare, with smooth extremities and a middle concentration of rounded proeminences; microscleres abundant microxea with a few larger spines at the central portion; gemmules abundant, free or singly contained in gemmular capsules of alpha megascleres; gemmoscleres with conspicuous variation of the shaft length and a circular or polygonal flat to ondulated lower rotule with thin, slightly incurved entire borders, upper rotule from knobed, with a few incurved spines or hooks to regular, small, umbonate with margins irregularly cut in a number of conspicuously incurved spines or hooks.

Redescription. Sponges with irregular shape and size, progressing from small thin crusts (figs. 1, 2) to larger thicker crust 5 to 20 cm in diameter and 2 to 4 cm high or sponges forming spherical or bulbous growths around branches and twigs reached by the flooding waters (fig. 3, also BURTON, 1938: pl. II, figs. 3, 4; BRIEN, 1968b: pl. III, fig. 25). Larger specimens are usually thicker at their middle portion (fig. 3) indicating new growth at each flooding period on top as well as around the mother sponge.

Surface conspicuously reticulated, covered by a thin ectosome. The usually conspicuous oscula may be located inside the furrows (fig. 3) on top of conical projections or aligned along the crests (BRIEN, 1968a: pl. I, figs. 1, 2).

The multispicular skeleton fibers form a reticulum which progresses from slim to very thick fibers and thus from large to very small, eliptical or polygonal meshes which are usually larger towards the sponge surface (BRIEN, 1968b: pl. III, fig. 26). Spongin scarce. Main and secondary fibers may be distinguished in the reticulate skeleton (fig. 4, also BRIEN, 1968b: pl. III, figs. 26, 27 and 33) or else all fibers are of about the same thickness (BRIEN, 1968b: pl. II, figs. 26, 27).

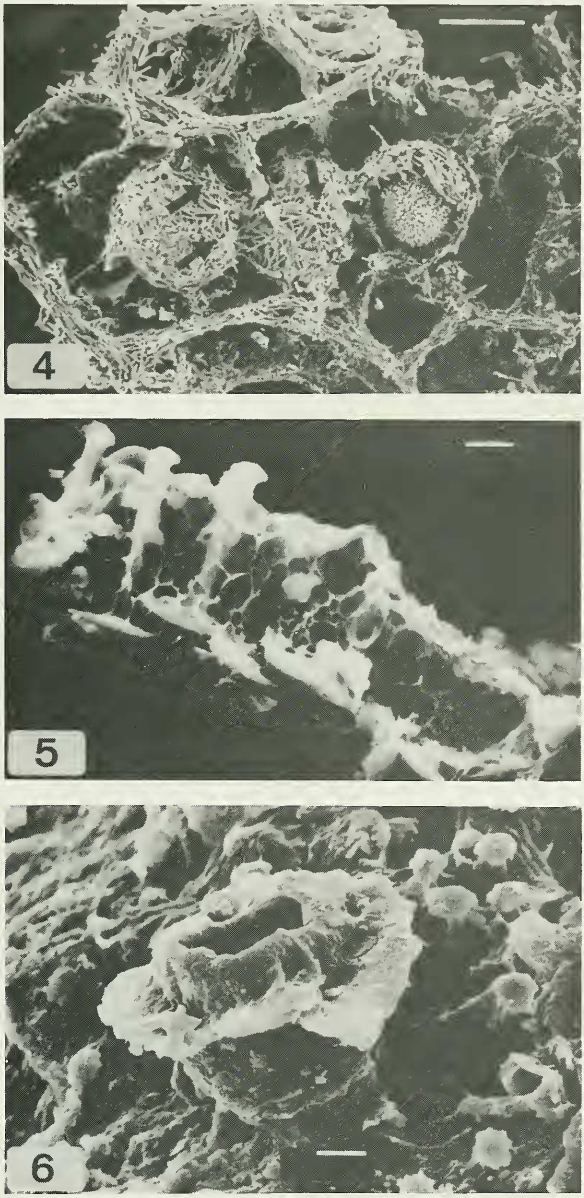
The abundant and variable sized gemmules are usually found free throughout the sponge coanosome, but they may also be singly held in capsules linked to one another and to the skeletal fibers (fig. 4). Some specimens show a larger concentration of gemmules in the basal portion. The gemmular capsules are built of alpha megascleres, microscleres and scanty spongin and progress from an open reticulum to closed walls which completely conceal the gemmules.

Dry sponge, light to dark brown or gray. A cross section of some specimens discloses differently colored layers, the greyish ones being harder and less friable than the brownish ones, all layers plenty of gemmules.

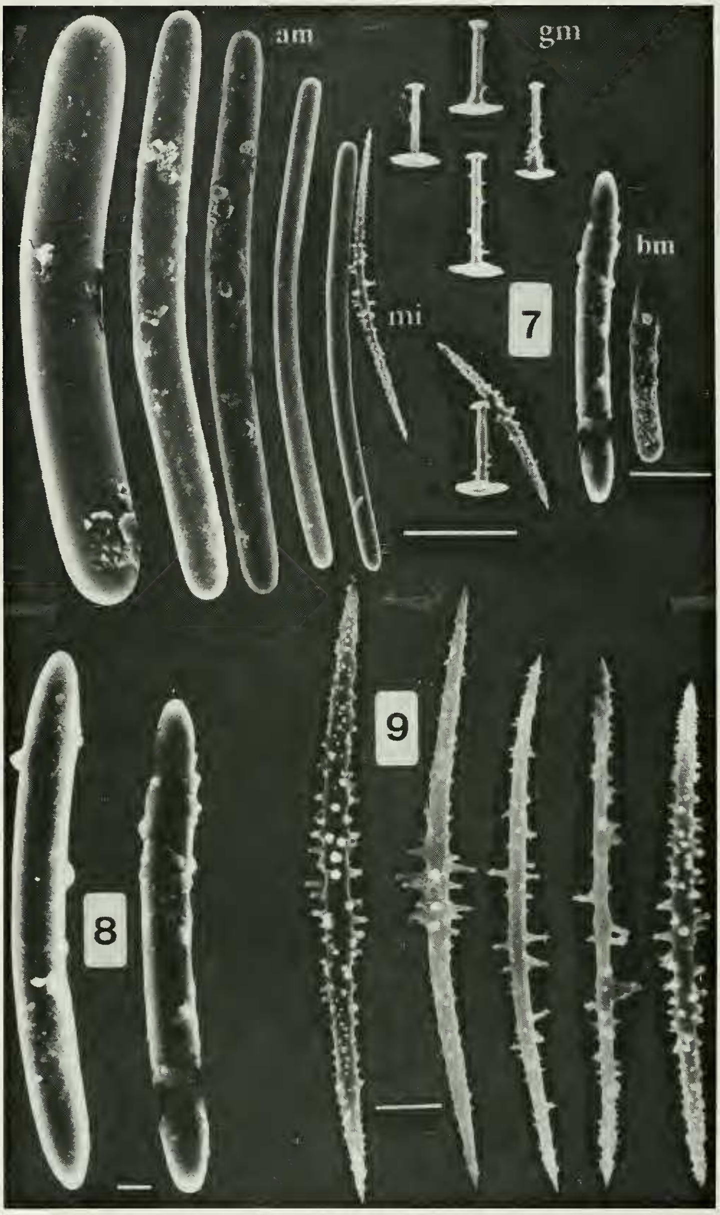
Alpha megascleres. Smooth, straight to slightly curved, short to long, slim to stout amphistrongyla with sometimes enlarged extremities (fig. 7, 11). Some rare styles present (fig. 11). The alpha megascleres build up the skeletal fibers as well as the gemmular cages. Dimensions: length 109.0 – 351.1 µm; width 8.5 – 53.3 µm.

Beta megascleres. Extremely rare. Short, stout, straight to slightly curved amphistrongyla with smooth extremities and a few to several rounded or bumped proeminences usually grouped at the spicule middle portion (figs 7, 8, 11). They reach from ½ to 2/3 the lenght of the shortest alpha megascleres (figs 7, 11). Their rareness did not allow for the determination of their position in the sponge skeleton. Some specimens seem to miss these spicules. Dimensions: length 81.8 –230.0 µm; width 10.0 – 19.2 µm.

Microscleres. Abundant, long, spined, slim to stout, curved, rarely straight microxea



Figs. 4-6. *Metania pottsi* (Weltner, 1895): 4, skeleton with gemmules showing the microscleres distribution (arrow); 5, gemmule wall in cross section; 6, gemmule surface with foraminal tube and the protruding upper rotules of the gemmoscleres. Bar = 500μm, fig. 4; bar = 10μm; figs. 5,6.



Figs. 7-9. Spicular components of *Metania pottsi* (Weltner, 1895): 7, alpha megascleres (am); beta megascleres (bm); gemmoscleres (gm); microscleres (mi) (scale at right applies only to the beta megascleres); 8, beta megascleres; 9, microscleres. Bar = 50μm, fig. 7; bar = 10μm, figs. 8,9.

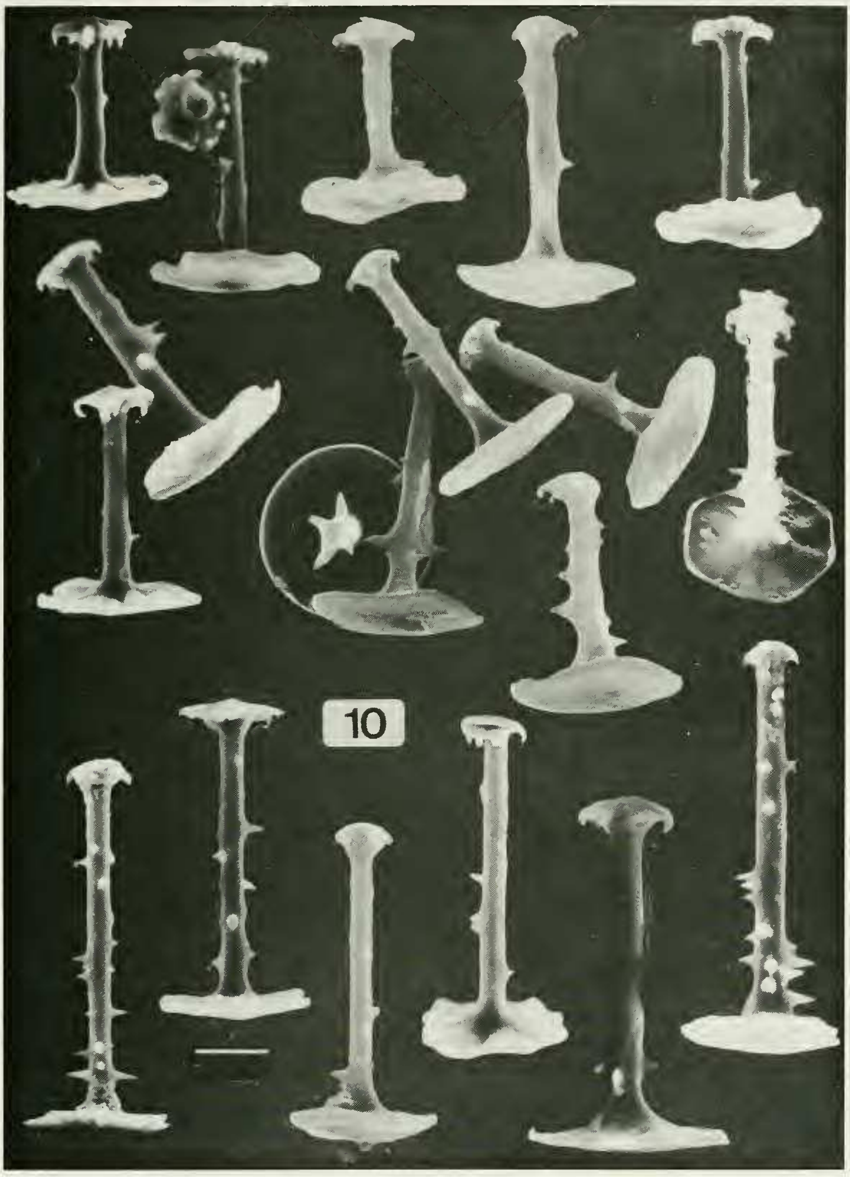


Fig. 10. *Metania pottsi* (Weltner, 1895): gemmoscleres. Bar = 10µm.

with abruptly, harpoon ended extremities (figs. 7, 9, 11). The middle reach of the spicule presents a few larger, straight spines capped by a crown of microspines; these larger spines grade to shorter and curved ones towards the spicule extremities (figs. 9, 11). The microscleres are found throughout the sponge body as well as in the capsules cointaining the gemmules. Dimensions: length 46.0 – 219.4 μm; width 1.84 – 9.2 μm.

Gemmoscleres. Abundant, boletiform, grading from very short to quite long ones (figs. 10, 11); the short ones exhibiting a few spines on the shaft, which misses the collar of spines on the lower rotule (fig. 10). The long ones with a sparse or densely spined, rarely smooth shaft usually provided with the collar of spines (fig. 10). The lower rotules vary from large, flat or undulated to also flat or umbonate smaller ones (figs. 10, 11); inner face of the lower rotule smooth or cointaining a few or several radial expansions of the shaft which may reach the rotule border, in this last instance determining a polygonal instead of a circular profile (figs. 10, 11); lower rotule with entire shallow incurved border (fig. 10); upper rotule progressing from a bumped expansion of the shaft bearing a few irregular and incurved spines or hooks to well developped, small and umbonate rotules their margins irregularly cut in an irregular number of conspicuously incurved spines or hooks (fig. 10). Shafts slim to stout with a few to several usually straight small to long acute spines irregularly distributed (figs. 10, 11). Dimensions: length 18.4–71.0 μm; width 1.84–7.5 μm; lower rotule 15.6–31.6 μm; upper rotule 4.5–16.1μm.

Gemmules. Extremely abundant, spherical, yellowish, with variable sizes and distributed throughout the sponge reticulum, solded to the skeleton fibers by slanting alpha megascleres, some spongin and microscleres which alltogether may envelope the whole gemmule into a solid capsule linked to the neighboring ones (fig. 4). Foraminal tube short, straight, of circular outline, devoid of gemmoscleres, and provided with an outstanding spongin collar which in the dry sponge draps down the middle part of the tubule (fig. 6). Gemmoscleres singly, radially embedded in the pneumatic coat with the lower rotules side by side set on the inner coat, the larger ones projecting part of the shaft and the upper rotule beyond the pneumatic coat (fig. 5). Pneumatic coat thin with polygonal irregularly sized and thin walled air spaces (fig. 5). Dimensions: 300.0 – 600.0 μm diameter.

Distribution. Congo basin in Zaire and Angola (fig. 12).

Habitat. The preferred substrate of the specimens were the seasonally submersed parts of the vegetation found in the flooded valleys of the Congo Basin, particularly its lower reach. However stones and even mussel shells may also be encrusted by the sponge.

The specimens were picked from the Congo River or its tributaries not far from Leopoldville and thus from the innundation valley of its lower reach, subjected to the seasonal floodings of the Tropical Rain Forest realm. Specimens encrusting substrates situated between the bottom and the top of the flooding water column would obviously benefit of longer or shorter immersion periods translated into stouter or slender skeletal and spicular construction as was observed in the studied materials. Recently TAVARES & VOLKMER-RIBEIRO (1997) demonstrated the amazing variations also imposed by the water current to the skeletal structure of specimens of a same species sampled from substrates along the water column.

Remarks. PENNEY & RACEK (1968) were the first to recognize *Tubella pottsi* as a *Metania* species when they included this species plus *M. lissostrongyla* Burton, 1938 in the synonymy of *Metania vesparia* (Martens, 1868). VOLKMER-RIBEIRO & COSTA (1993)

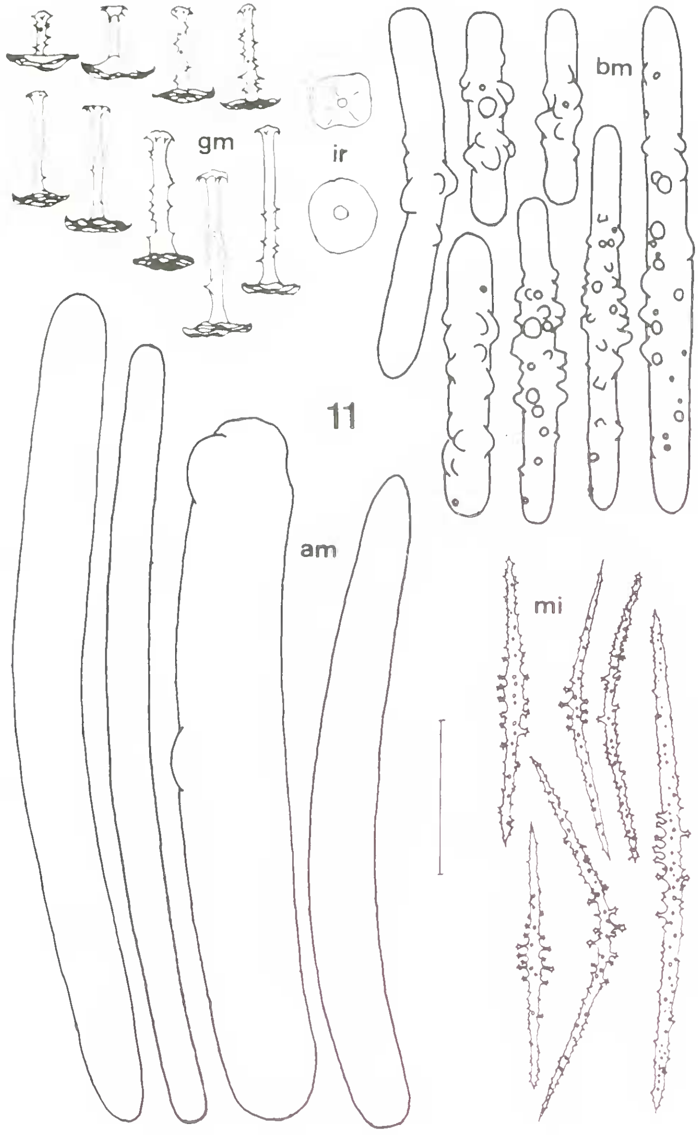


Fig 11. Spicular components of *Metania pottsi* (Weltner, 1895): alpha megascleres (am); beta megascleres (bm); gemmoscleres (gm); microscleres (mi); inner face of the gemmoscleres lower rotules (ir). Bar = 50 µm.

removed *T. pottsi* and *M. lissotrongyla* from the synonymy of *M. vesparium* from Borneo, emphasizing the necessity of a revisive study of the ethiopian species of *Metania*. The identity of characters detected in the type specimens of *Metania lissostrongyla* Burton, 1938, *M. vanryni* Brien, 1968 and *M. pottsi* is now clearly established upon the comparative study of the sponges shapes and SEM study of their skeleton and gemmular structures and spicules. The same holds true for the type material of *Potamolepis shoutedeni* Burton, 1938. The synonymy of *Parametania schoutedeni*, type species of the genus *Parametania* Brien, 1968, with *Metania pottsi*, confirms VOLKMER-RIBEIRO's 1986 synonymyzation of *Parametania* with *Metania*.

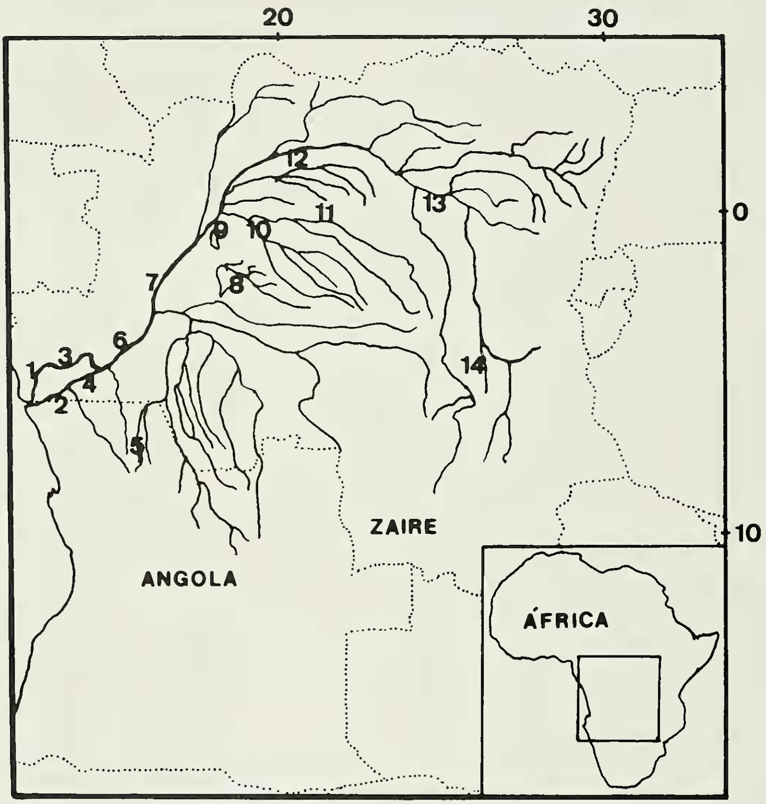


Fig. 12. Distribution of *Metania pottsi* (Weltner, 1895) in the Congo basin: 1-3, 6-14, Zaire; 2, 4, 5, Angola; 1, 3, Chiloango River; 2, 4, Lukula River; 5, Dombondola; 6, Kalina River, Léopoldville; 7, 12, Congo River; 8, Léopold II Lake; 9, Tumba Lake; 10, Ruki River; 11, Boende; 13, Yangambi River; 14, Luali River.

Examined material. **ZAIRE** [ex Belgian Congo]: River Chiloango, 1875, von Mechow leg., ZMB 1765 (holotype); River Yangambi, 9.XII.1946, INEAC leg., MRAC 897a, b, c, d; Eala, River Ruki, 1938, P. Brien leg., MRAC 130 (paratype of *Metania lissostrongyla)*, BMNH 1938:2:1:3; Boende, 1940, R. P. Hulstaert leg., MRAC 532; Lake Tumba, II.1921, H. Schouteden leg. (holotype of *Metania lissostrongyla*); Inongo, Lake Leopold II [ex Lake Mai-Ndombe], 26.VIII.1964, H. Dubois leg., MRAC 1680; Léopoldville, River Kalina, VIII.1946, E. Dartevelle leg. (holotype of *Metania vanryni*); River Kalina, III.1949, E. Dartevelle leg., MRAC 596; River Zaire [ex Congo], Stanley Pool (cf. Brien, 1968: 395), 1937, A. Tinnant leg., MRAC 141 (holotype of *Metania schoutedeni*); River Congo, 1938, P. Brien leg., MRAC 401, 402, 406, 408; River Congo, 1937, H. Schouteden leg., BMNH 1938:2:3:7; Luali, River Chiloango, VIII. 1933, E. Dartevelle leg., MRAC 1; River Chiloango, Mission Cassel leg., MRAC 2 ; River Chiloango, 1937, E. Dartevelle leg., MRAC, 1697; Mayumbe, River Lukula (between Schinf Kobe and Kai-Ku Padi), 1937, E. Dartevelle leg, MRAC 133 (paratype of *Metania lissostrongyla*); River Lukula, 1937, H. Schouteden leg., BMNH 1938:2:3:3, MRAC 795, 796, 797, 798; **ANGOLA**: Dombondola, 1938, A. Powell-Cotton leg., BMNH 1938:5:10:1.

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